

# IMAGE ENHANCEMENT EXPERTISE COMES TO THE COURTROOM

The technology Al Tietjen uses to help catch crooks is not really all that new. After all, digital image enhancement has been around since the 1970s. In fact, many desktop publishing software programs provide simple digital enhancement features, and many other complementary programs provide a more sophisticated suite of enhancement algorithms.

However, the use of this technology in law enforcement is new, partially because today's image-producing programs cannot provide the detailed documentation needed in a criminal investigation. Therefore, police departments must retain the services of specialists who can defend their image enhancement routines in court. Tietjen, a contractor with Nichols Research Corporation at the BMDO imaging facility known as Innovative Science and Technology Experimentation Facility (ISTEF) (Kennedy Space Center, FL), is one such specialist. He enhanced images in what became the first trial in the United States to admit digitally enhanced video images as evidence.

In this case—the 1989 abduction and murder of Lori Auker, of Point Township, Pennsylvania—investigators obtained time-lapse video from the camera of an automated teller machine near where Lori was last seen. The police found three fuzzy pictures from the video they thought might help them. In the background, they could make out a car entering and leaving the camera's field of view. The second picture showed a woman standing outside the passenger side of the car, wearing clothes that matched Lori's outfit that day.

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Though the police had gathered a lot of supporting evidence, they still needed to link the car in that picture to the suspect, Lori's former husband. Their only hope was digital image enhancement. After some preliminary work with several groups, they turned to BMDO/ISTEF, which agreed to donate its technology and facilities, and to Al Tietjen, who donated his time to the project. During the trial an expert witness from General Motors used Tietjen's enhanced images to identify the make and model of the car to within 2 years. That information, combined with other testimony, established a detailed chronology of the suspect's whereabouts and activities, and helped secure a conviction.

Since then, Tietjen has assisted in many other investigations, including the celebrated case of the Gainesville Slasher, which involved the murder of five students at the University of Florida. These efforts began demanding more resources than BMDO/ISTEF could realistically provide, so Tietjen has continued this work as a part-time consultant with Spaceport Technologies, Inc. (Titusville, FL).

Tietjen's experience in the field has made him realize that police departments need better technology to do their jobs. There are simply more cases than qualified specialists, or the funds to hire them. Therefore, Tietjen is developing expert system software to analyze the imagery automatically, select algorithms, adjust control parameters, and provide the detailed documentation needed to defend digital image enhancement in court.

## ABOUT THE TECHNOLOGY

Digital image enhancement uses computer hardware and software to digitize a picture, enhance certain features, and send the output to video, hard copy, or computer file. The enhancement algorithms consist of a specialized suite of filters and transforms. Tietjen's expert system software will allow a nonspecialist to use these algorithms without detailed knowledge of how they work. Because the software is targeted at law enforcement needs, he is tailoring it to the unique problems of enhancing time-lapse videotape recordings and photography.

Much of Tietjen's expertise in this field was developed while working at BMDO/ISTEF and earlier aerospace positions. ISTEF is dedicated to evaluating sensor technology used in ballistic missile defense systems.



This frame of a time-lapse video, taken from an automated teller machine, pictures a car behind the man—a possible link to the crime.



The image of the car was enhanced and identified in court as the same type of car that Robert Auker drove the day of the abduction.